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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/686,697	10/16/2003	Paul A. Kohl	62020-1550	7668

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EXAMINER

THORNTON, YVETTE C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 08/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/686,697

Applicant(s)

KOHL ET AL.

Examiner

Yvette C. Thornton

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 02022004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This is written in reference to application number 10/686,697 filed on October 16, 2003 and published as US 2004/0132855 on July 8, 2004.

Priority

1. Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged.

Information Disclosure Statement

2. The Information Disclosure Statement filed on February 2, 2004 has been entered and fully considered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The examiner is unclear if the claimed "polymer" of instant claims 1, 11 and 23 pertain to a polymer composition comprising a sacrificial polymer, a photoinitiator and a solvent (cl. 10) or if the "polymer" has a sacrificial component and a photoinitiator component (i.e., copolymer). Clarification is requested.

For the purposes of examination, the examiner has interpreted the claims to pertain to a composition comprising a sacrificial polymer, a photoinitiator and a solvent (cl. 10).

5. Claim 10 recites the limitation "the solvent" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1-2, 4-8, 10-12 and 14-27 are rejected under 35 U.S.C. 102(a) as being anticipated by Wu et al. (Journal of The Electrochemical Society).

a. *The examiner notes that the cited reference was available electronically August 16, 2002, which is prior to the effective filing date of October 16, 2002. Thereby making the said reference citable as prior art under 35 USC 102(a).*

b. Wu teaches a simple and flexible method for the direct patterning of a sacrificial material, which makes photosensitive version of sacrificial polymers that can be used in an analogous fashion to conventional polymers (see Fig. 2). This has two distinct advantages: (i) the number of processing steps to produce the patterned polymer structure is greatly reduced and (ii) the opportunity to use “gray scale” lithographic masks and methods to produce channels that have structure in the direction normal to the substrate, which unlocks the possibility of truly 3D patterns. The taught invention is aimed at exploring the influence of formulation and processing on the lithographic performance of photodefinable polynorbornene (PNB) sacrificial materials. Photosensitive materials have been obtained by synthesizing PNB polymers containing cross-linkable functional groups formulated with photosensitive radical initiators (pg. G555, c. 2, l. 7-36). It may also be desired to

perform gray scale imaging to obtain patterned features with different heights and shapes in the vertical direction. In this way, truly 3D structured patterns could be generated (pg. G557, c. 2, l. 8-28). The experimental section of the Wu exemplifies a composition comprising copolymers of butyl norbornene (BuNB) and pendant alkenyl-substituted norbornene (ANB) (Fig.3; Table 1). The solvent mesitylene and the photo-initiator benzoin ethyl ether (BEE) were admixed with the taught copolymer. Specifically, the exemplified solution comprises 16 wt% of PNB, 4 wt% BEE and 80 wt% of mesitylene (Table II).

Figure 2 is a schematic of the processing steps in the taught fabrication method using photopatternable polymer sacrificial materials. The sacrificial polymer is spin coated on a silicon wafer, soft-baked, exposed, post-exposure baked and developed to form an image. The image is then overcoated with a layer of SiO₂/SiN_x/Polymer and decomposition occurs to form a 3D image (see experimental section). Wu teaches that the use of thermally sacrificial polymers can be used to act as placeholders and fabricate microchannels during the buildup of complex devices is well known in the art. After fabrication, the polymer can be heated and cleanly decomposed to leave behind the desired open channel structures (pg. G555, c. 1, l. 31-40).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Rutter et al. (US 2004/0076910 A1) pertaining to a stripping method.

- Gallagher et al. (US 2004/0137728 A1) pertaining to air gap formation.
- Devoe et al. (US 2004/0126694 A1) pertaining to microfabrication of organic optical elements.
- Schick et al. (US 6121340 A) pertaining to photodefinable dielectric compositions comprising polycyclic polymers.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette C. Thornton whose telephone number is 571-272-1336. The examiner can normally be reached on Monday-Thursday 8-6:30.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Yvette Clarke Thornton
Primary Examiner

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July 29, 2004